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midable appearance rather than actually useful as defensive instruments.

While the fossil remains of these animals are not uncommon in our museums, they consist for the most part of the scattered and disarticulated bones of the skeleton, the present specimen being the only mounted skeleton of this animal on exhibition at this time.

In Fig. 2 is shown a model restoration of *Stegosaurus* prepared by the writer and which portrays his conception of the life appearance of this animal. In this restoration is incorporated all the latest evidence relating to its external appearance, and it is thought to give a fairly accurate picture of the living animal. The recent discoveries of skin impressions with the fossil remains of other dinosaurian specimens makes it not unreasonable to expect that *Stegosaurus* had a scale-like integumentary covering, instead of the smooth elephant-like skin as here depicted. In the light of these recent discoveries we may yet hope to have still more definite knowledge as to its true nature.

CHARLES W. GILMORE

### THE SULPHUR SITUATION IN THE UNITED STATES

A PUBLICATION of the U. S. National Museum under the title "Sulphur: An Example of Industrial Independence," by Joseph E. Pogue of the Division of Mineral Technology, presents in a simple and non-technical manner the striking aspects of one of the most interesting mineral industries in our country to-day. A feature of value is a series of half-tone plates, made not only from actual photographs of mining operations, but also from several views of a miniature model-reproduction of a typical sulphur mine, with the underground disposition of the sulphur exposed to sight, so reproduced as to

give the appearance of bird's-eye or aeroplane view of both occurrence and mining.

At the outbreak of the war in 1914, the United States was producing each year about 350,000 tons of sulphur, valued at a little over \$6,000,000. This quantity was sufficient to supply not only the needs of this country, but contributed about 100,000 tons to European markets. With the development of war activities, however, the production has increased to meet the growing needs of munition makers, while the exports have decreased as a result of disturbed trade conditions and the need for building up reserves of this essential material at home.

It is a singular fact that the chief raw materials of explosive manufacture are localized in a remarkable manner, and sulphur is no exception to this rule. In the United States practically the entire supply comes from a number of deposits in Louisiana and Texas near the Gulf Coast. These deposits are similar in nature and consist of a series of beds and lenses of pure sulphur at a depth of several hundred feet from the surface.

The discovery of the occurrence of sulphur of this type was made as far back as 1865, in connection with a well drilled for oil. All attempts at mining the sulphur failed, however, until some fifteen years ago, when a highly ingenious method was devised for winning this substance without recourse to the ordinary costly underground operations usually prosecuted in mining. This process makes use of the fact that sulphur melts at a relatively low temperature. By drilling a well through the overlying rock until the sulphur bed is tapped and then sinking a series of interpenetrating pipes through which superheated steam is forced, the sulphur is melted and forced to the surface as a hot liquid, where it is piped

to large bins, into which it pours and cools. This process, which is known as the Frasch process after its inventor, has been described as one of the triumphs of modern technology, and its successful application to the Gulf Coast deposits has in the past fifteen years transferred the center of the world's sulphur industry from the island of Sicily to the United States, making our nation absolutely independent of the rest of the world in this important particular.

With the development of the world war, the sulphur deposits of the Gulf Regions have, of course, assumed special importance as supplying the sulphur needed in the manufacture of gunpowder and other explosives. But in addition to this, these deposits have quite unexpectedly during the past few months been able to meet and solve a critical resource problem arising out of the submarine campaign. This problem concerned the raw materials of the large and very vital sulphuric-acid industry, and arose from the fact that most of the several million tons of sulphuric acid used in this country was made from a sulphur-bearing mineral called pyrite, brought as ballast in quantity from large deposits in Spain. The restricted shipping conditions resulting from recent events as a matter of course seriously affected this source of supply, and since sulphuric acid is a product nearly as fundamental to industry as iron or coal, the situation bade fair to assume critical proportions. But it so happens that crude sulphur under emergency can also be used in making sulphuric acid, and accordingly the Gulf sulphur deposits have come forward to tide over the dearth of Spanish pyrite until the domestic supplies of pyrite, which are adequate but as yet only in part developed, can be brought up to a suitable measure of productiveness.

There are numerous lean deposits

of sulphur in many of the western states, but these as yet have practically no effect upon the output of the country. It is therefore certain that without the Gulf deposits and the ingenious method of making them available, this country would have scarcely been able to meet successfully the war needs of sulphur and sulphuric acid; which goes to show, of course, the pressing necessity for widespread appreciation and understanding of the importance of proper development of the mineral industries of our nation.

#### WAR WORK OF THE U. S. COAST AND GEODETIC SURVEY

THE steamers *Surveyor*, *Isis* and *Bache*, of the Coast and Geodetic Survey, their crews and 38 commissioned officers of the survey have been transferred to the Navy Department, and 29 commissioned officers and 10 members of the office force have been transferred to the War Department with military rank corresponding to their grade in the survey.

In conformity with the wishes of the Navy Department, after the beginning of the war all of the topographic, hydrographic and wire-drag work of the survey was directed so as to meet the most urgent military needs of the Navy Department. The work done comprises wire-drag surveys on the New England coast and coast of Florida; hydrographic surveys on the South Atlantic coast and Gulf of Mexico; the beginning of a survey of the Virgin Islands; the investigation of various special problems for the Navy Department; wire-drag surveys, current observations, and special work on the Pacific coast; and surveys in the Philippine Islands.

The work undertaken for the War Department by the field parties of the Coast and Geodetic Survey was intended to furnish points